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**B1T
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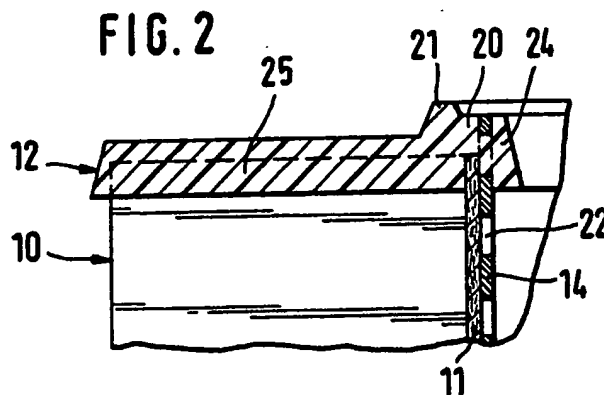
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(54) Air filter

(57) An air filter for the intake of an I.C. engine or compressor comprises a housing in which an annular filter element is clamped. The element comprises pleated paper 11 and an internal perforate support sleeve 14, both embedded in resilient plastics end discs 12 with the sleeve 14 completely penetrating the thickness of the discs so that it abuts the clamping surfaces of the housing and receives the clamping force directly, thereby preventing axial compression of the element and possible cutting of the end discs by the sleeve ends. The sleeve ends may be bent over, and a second sleeve may be provided outside the paper.



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FIG. 1

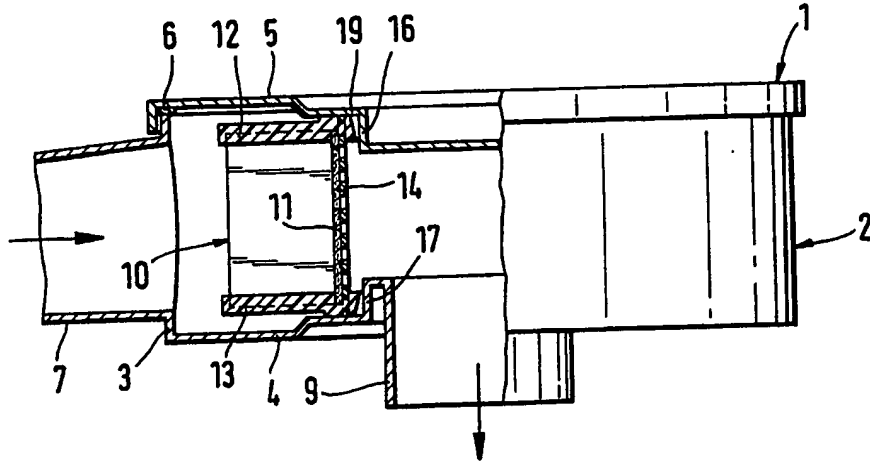


FIG. 2

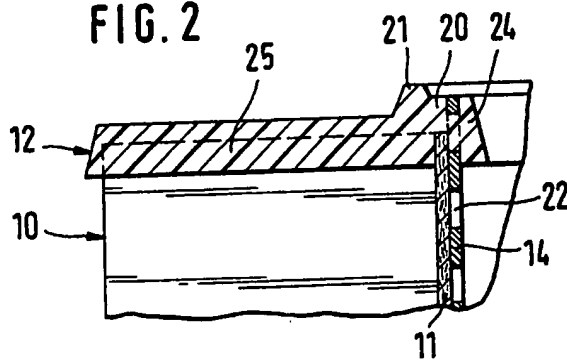


FIG. 3

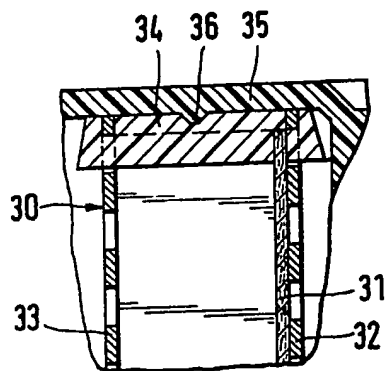
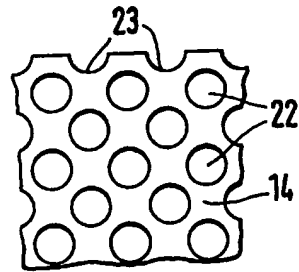


FIG. 4

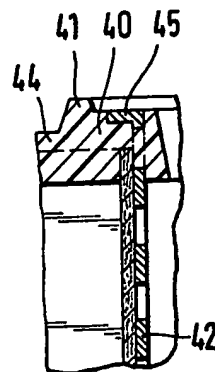


FIG. 5

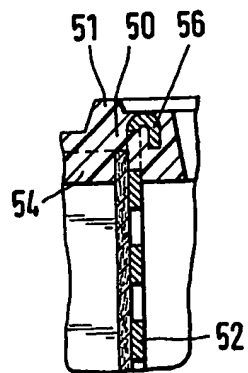


FIG. 6

SPECIFICATION

An air filter for internal combustion engines, compressors and other machines which draw-in air

The present invention relates to an air filter for internal combustion engines, compressors and other machines which draw-in air including an annular, interchangeable, radially traversable filter insert which is axially clamped in a filter housing and has, on at least one end, an end plate or disc made of elastically resilient plastics material and in which end disc there is embedded the filtering means and the end of an air-permeable support casing, and wherein said end disc axially abuts a wall of the filter housing in sealing fashion.

The filtering means which is normally used for such annular, radially traversable filter inserts is filter paper which has been folded in star-shaped fashion and which is embedded at its front end in end discs made of elastically resilient plastics material. These end discs seal the leading ends of the filter insert and, since their material has elastically resilient properties, the end discs permit sealing abutment of the filter insert to abut against adjacent, fixed walls of the filter housing without requiring a special sealing ring to be inserted therebetween. To enable the axial thrust pressure, which is required therefor to be transferred from one end of the filter insert to the other end, an air-permeable support casing is usually provided which is embedded in the end discs.

In known intake air filters of the above-mentioned type, the end of the support casing is so embedded in plastics material that the end of said support casing is clearly covered by a layer of plastics material. To reduce the risk of the support casing through the elastic plastics material and the filter insert being inadmissibly compressed in the event of axial thrust being applied, the area of the end of the support casing has been enlarged. Thus, GB Patent Specification 1 245 419 describes an air filter with a filter insert, in which the outer support casing is shaped as a flange. Problems arise, however, in the manufacture of suitable filter inserts, particularly when the support casing is made from perforated or extruded sheet metal in order to achieve adequate rigidity in the axial direction. Air bubbles are easily formed between the end which has been thus shaped and the outer surface of the end disc, and such air bubbles may cause leakage. This danger increases as the radial dimension for the flange-shaped end of the support casing increases. If, however, these dimensions are made too small, it is more likely that, in the long run, the elastic plastics material will be unable to withstand the thrust pressure of the wedge-shaped front end of the support casing.

The invention seeks to improve, by simple means, the longterm strength of a filter insert, which is axially clamped in an intake air filter of the above-mentioned type of construction.

In accordance with the invention, the object is achieved in that the support casing of the filter insert fully penetrates the elastic end disc, and the adjacent end of said support casing directly abuts axially a wall of the filter housing.

The axial thrust forces are now transferred directly from the support casing to the filter housing. Damage to the plastics material end discs is positively prevented. In respect of its axial dimension, the support casing can be easily manufactured with relatively low tolerances, so that the filter housing, which has to absorb these axial tolerances, does not need to meet special requirements. However, the axial thrust may vary within relatively broad limits. One limit is determined by the sealing which is required between the end disc at the outer end and the fixed wall of the filter housing, and the other limit is determined by the rigidity of the support casing to withstand axial pressure. The plastics materials which are used for such end discs are caused to deform or flow by continuous pressure loading, but now such a flow of plastics materials no longer leads to the filter insert in the filter housing becoming loose and ultimately becoming permeable.

One embodiment of the invention relates to an intake air filter of this type, in which the end disc of the filter insert is provided with an axially protruding annular bead, which bead abuts a rigid wall of the filter housing in sealing fashion and accommodates the adjacent end of the support casing. The embodiment is characterised in that the annular bead includes an annular sealing projection member, which projection member is arranged concentrically with the support casing and protrudes slightly beyond the end of the support casing when the filter insert is not installed. To achieve sealing abutment in the intake air filter, a filter insert of this construction merely requires a flat annular surface, for example a shoulder, against which both the sealing projection member and the front end of the support casing can then abut directly.

Further embodiments of the invention relate to the advantageous design for the end of the support casing which is embedded in the end disc during formation by moulding thereof.

The invention will be described further, by way of example, with reference to the accompanying drawings, in which:-

Figure 1 is a partial, axial sectional view of an intake air filter;

Figure 2 is an enlarged axial sectional view of the installed filter insert used in the intake air filter of Fig. 1;

Figure 3 is an enlarged fragmentary detail illustrating the elongate form of the support

casing used in the filter insert of Fig. 2; and Figure 4 to 6 illustrate modified embodiments.

5 An air filter 1 has a cup-shaped filter housing 2 comprising a housing casing 3, a housing base 4 with the filter housing 2 being sealed by a housing cover 5 at its upper, open leading end. Conventional clamping hooks (not shown) are provided to press the housing cover 5 against a sealing ring 6 which sealingly abuts the end of the housing casing 3. An air inlet pipe 7 extends from the housing casing 3, and a clean or filter air pipe 9 extends from the housing base 4.

15 A filter element or insert 10 is sealingly and axially clamped in the filter housing 2 between the housing cover 5 and the housing base 4, and the filter element or insert 10 is centred from the housing cover 5 and the housing base 4 by means of the shoulders 16 and 17. The filtering means 11 of the filter insert 10 comprises a filter paper which has been folded in star-shaped fashion and which is embedded at the upper end in an end disc 12 and at the lower end in an end disc 13. The filtering means 11 is supported on the internal periphery by an air-permeable support casing 14, and the outer ends of said support casing 14 are also embedded in the end discs 12 and 13 respectively. The two end discs 12 and 13 are made of an elastically resilient plastics material which, in known manner, permits sealing abutment against rigid housing portions without requiring a sealing ring to be inserted therebetween.

The drawn-in air flows in the direction of the arrows through the inlet pipe 7 into the interior of the filter housing 2, traverses the filter insert 10 radially inwardly from the exterior and leaves the intake air filter 1 through the filtered air pipe 9 belonging to the machine which draws-in air. (not shown).

As is clearly illustrated in Fig. 2, the support casing 14 fully penetrates the end disc 12, so that the leading end of said support casing 14 directly abuts axially the housing cover 5 when installed, as shown in Fig. 1. However, the leading end of the filtering means 11 is clearly spaced from the axially external surface of the end disc 12.

The end disc 12 is provided with an annular bead 20 which accommodates the adjacent end of the support casing 14 and includes an annularly projecting sealing portion 21 which, when the filter insert 10 is not installed protrudes slightly beyond the front end of the support casing 14. Once the filter insert 10 has been clamped in position, this sealing portion 21 is pressed-flat by the annular shoulder 19 of the housing cover 5 so that, as illustrated in Fig. 1, the support casing 14 then directly abuts the housing cover 5.

The outer ends of the support casing 14 may be imperforate. However, the support

casing 14 may also be constructed as shown in Fig. 3. It is essential for the end of the support casing 14 which is embedded in the end disc 12 to have openings 22 and/or recesses 23 formed therein, since such openings 22 and/or recesses 23 allow material to penetrate therethrough when the end disc 12 is connected to the support casing 14 so as to join the ring 24 of the end disc 12 to the ring 25 surrounding the ring 24, which ring 24 is enclosed by the support casing.

In the embodiment shown in Fig. 1, the lower end disc 13 is of an identical construction; it is sealed from the adjacent, rigid housing portions and centred like the upper end disc 12.

In the embodiment shown in Fig. 4, which is a fragmentary detail through an annular wall portion of a filter insert wherein the filter insert 30 also has a filtering means 31 which is in the form of filter paper folded in star-shaped fashion, such filtering means 31 being secured on its inner periphery by an inner support casing 32 and on its outer periphery 90 by an outer support casing 33. The leading ends of the filtering means 31, the inner support casing 32 and the outer support casing 33 are embedded in an end disc 34 made of an elastic plastics material. The ends of the support casings 32 and 33 fully penetrate the end disc 34 so that, when they are clamped in position as shown, they directly abut the housing cover 35 which is also made of plastics material, though of a harder type. However, the leading end of the filtering means 31 is clearly spaced from the outer surface at the outer or leading ends of the end disc 34. The housing cover 35 is provided with an annular rib 36 which presses into the originally flat end of the end disc 34 when the filter insert 30 has been installed, said annular rib 36 thereby ensuring that the filter insert 30 is positively sealed from the housing cover 35.

The embodiments shown in Figs. 5 and 6 differ essentially from the embodiment shown in Fig. 2 in respect of the form of the leading ends of support casings 42 and 52 which are embedded in the end discs 44 and 54 respectively. In the embodiment shown in Fig. 5, the end of the support casing 42 which is embedded in the end disc is bent-over to form a flange 45. In the embodiment shown in Fig. 6, the end of the support casing 52 which is embedded in the end disc 54 is provided with a bent-over portion 56. The flange 45 and the bent-over portion 56 serve to enlarge the contact face of the support casings 42 and 52, which fully penetrate the end discs 44 and 54, so as to prevent the adjoining, rigid filter housing portion from becoming damaged.

CLAIMS

130 1. An air filter for machines which draw-in

air, including an annular, interchangeable, radially traversable filter insert which is axially clamped in a filter housing and has, on at least one end, an end plate or disc made of
5 elastically resilient plastics material and in which end disc there is embedded the filtering means and the end of an air-permeable support casing, and wherein said end disc axially abuts a wall of the filter housing in sealing
10 fashion, characterised in that the support casing fully penetrates the elastic end disc and the adjacent end of said support casing abuts axially and directly on a wall of the filter housing.

15 2. An air filter as claimed in claim 1, in which the end disc is provided with an axially protruding annular bead, which bead abuts a wall of the filter housing in sealing fashion and accommodates the adjacent end of the support casing, characterised in that the annular
20 bead includes an annular sealing projection member which projection member is arranged concentrically with the support casing and protrudes slightly beyond the front end of the support casing when the filter insert is not
25 installed.

3. An air filter as claimed in claim 1 or 2, in which the end of the support casing which is embedded in the end disc is provided with
30 openings and/or recesses.

4. An air filter as claimed in any of claims 1 to 3, in which the end of the support casing which is embedded in the end disc is bent-over to form a flange.

35 5. An air filter as claimed in any of claims 1 to 3, in which the end of the support casing which is embedded in the end disc is provided with a bent-over portion.

6. A filter insert for use in an air filter
40 comprising an annular, radially traversable filter means having at least one end plate or disc of elastically resilient plastics material in which there is embedded an end region of the filtering means and an end of an air permeable support casing; said support casing extending through a surface of the disc remote
45 from the filtering means so as, in use, to be able to directly abut a contacting surface of a housing of the air filter.

50 CLAIMS (18 Nov 82)

7. A filter insert substantially as herein described with reference to and as illustrated in the accompanying drawings.

55 8. An air filter substantially as herein described with reference to and as illustrated in the accompanying drawings.